Prioritized Technology:
Technologies to Sample Plumes of Ocean Worlds from Orbit/Flyby

Technical Goals

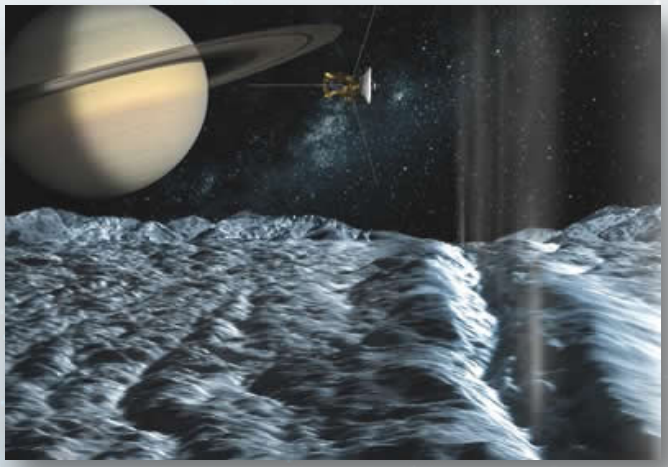
- Collect **>10 µL** sample of 1- 10 µm ice particles from Enceladus plume with a density up to **10^5 molecules/mL** travelling up from the moon at up to **600 m/s**.
- Collect at least **10^6** sub-µm aerosol particles from the upper atmosphere of Titan

Technical Status/ SOA

- Cassini INMS samples Enceladus plume – not optimized for acqueous sample collection
- Europa Clipper instruments: MASPEX and SUDA (also not optimized to sample biogenic materials)
- SPECIES – collecting area of 25 cm^2 proposed for Europa as an exosphere gas collector – not optimized for acqueous sample collection
- Stardust – Collected gas and particulates not - not optimized for acqueous sample collection or in-situ analysis
- COLDTech EFunfunnel for Enceladus plume
- Two-tiered metal collector with hydrophobic pattern and high depth/cross section ratio

Mission Applications

- Plumes erupting from the surface of Europa and Enceladus are thought to originate in their sub-surface oceans. Retrieving material from the plumes would be a relatively simple way to access material from the sub-surface oceans and to assess their habitability/inhabitance.



Cassini is flying through the mysterious plumes of Enceladus.